Main Criteria: Forward Education
Secondary Criteria: Washington DC Academic Standards
Subjects: Mathematics, Science, Technology Education
Grades: 11, 12, Key Stage 4

Forward Education

Autonomous Electric Vehicles of the Future

Washington DC Academic Standards
Mathematics
Grade **11** - Adopted: **2010**

CONTENT STANDARD / STRAND / DISCIPLINE	DC.CC.M P.	Mathematical Practices
STANDARD / ESSENTIAL SKILL	MP-1.	Make sense of problems and persevere in solving them.
STANDARD / ESSENTIAL SKILL	MP-2.	Reason abstractly and quantitatively.
STANDARD / ESSENTIAL SKILL	MP-3.	Construct viable arguments and critique the reasoning of others.
STANDARD / ESSENTIAL SKILL	MP-4.	Model with mathematics.
STANDARD / ESSENTIAL SKILL	MP-8.	Look for and express regularity in repeated reasoning.

CONTENT STANDARD / STRAND / DISCIPLINE	DC.CC.A.	Algebra
STANDARD / ESSENTIAL SKILL	**A-CED.**	**Creating Equations**
STUDENT EXPECTATION / ESSENTIAL SKILL		**Create equations that describe numbers or relationships.**
EXPECTATION	A-CED.2.	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

CONTENT STANDARD / STRAND / DISCIPLINE	DC.CC.A.	Algebra
STANDARD / ESSENTIAL SKILL	**A-REI.**	**Reasoning with Equations and Inequalities**

STUDENT EXPECTATION / ESSENTIAL SKILL		**Understand solving equations as a process of reasoning and explain the reasoning.**
EXPECTATION	A-REI.1.	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

CONTENT STANDARD / STRAND / DISCIPLINE	**DC.CC.F.**	**Functions**
STANDARD / ESSENTIAL SKILL	**F-IF.**	**Interpreting Functions**
STUDENT EXPECTATION / ESSENTIAL SKILL		**Analyze functions using different representations.**
EXPECTATION	**F-IF.7.**	**Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.**
SKILL	F-IF.7.a.	Graph linear and quadratic functions and show intercepts, maxima, and minima.

CONTENT STANDARD / STRAND / DISCIPLINE	**DC.CC.F.**	**Functions**
STANDARD / ESSENTIAL SKILL	**F-LE.**	**Linear and Exponential Models**
STUDENT EXPECTATION / ESSENTIAL SKILL		**Construct and compare linear and exponential models and solve problems.**
EXPECTATION	**F-LE.1.**	**Distinguish between situations that can be modeled with linear functions and with exponential functions.**
SKILL	F-LE.1.a.	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

CONTENT STANDARD / STRAND / DISCIPLINE	**DC.CC.G.**	**Geometry**
STANDARD / ESSENTIAL SKILL	**G-GPE.**	**Expressing Geometric Properties with Equations**
STUDENT EXPECTATION / ESSENTIAL SKILL		**Use coordinates to prove simple geometric theorems algebraically**
EXPECTATION	G-GPE.5.	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

CONTENT STANDARD / STRAND / DISCIPLINE	DC.CC.MP.	Mathematical Practices
STANDARD / ESSENTIAL SKILL	MP-1.	Make sense of problems and persevere in solving them.
STANDARD / ESSENTIAL SKILL	MP-2.	Reason abstractly and quantitatively.
STANDARD / ESSENTIAL SKILL	MP-3.	Construct viable arguments and critique the reasoning of others.
STANDARD / ESSENTIAL SKILL	MP-4.	Model with mathematics.
STANDARD / ESSENTIAL SKILL	MP-8.	Look for and express regularity in repeated reasoning.

CONTENT STANDARD / STRAND / DISCIPLINE	DC.CC.A.	Algebra
STANDARD / ESSENTIAL SKILL	**A-CED.**	**Creating Equations**
STUDENT EXPECTATION / ESSENTIAL SKILL		**Create equations that describe numbers or relationships.**
EXPECTATION	A-CED.2.	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

CONTENT STANDARD / STRAND / DISCIPLINE	DC.CC.A.	Algebra
STANDARD / ESSENTIAL SKILL	**A-REI.**	**Reasoning with Equations and Inequalities**
STUDENT EXPECTATION / ESSENTIAL SKILL		**Understand solving equations as a process of reasoning and explain the reasoning.**
EXPECTATION	A-REI.1.	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

CONTENT STANDARD / STRAND / DISCIPLINE	**DC.CC.F.**	**Functions**
STANDARD / ESSENTIAL SKILL	**F-IF.**	**Interpreting Functions**
STUDENT EXPECTATION / ESSENTIAL SKILL		**Analyze functions using different representations.**
EXPECTATION	**F-IF.7.**	**Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.**
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CONTENT STANDARD / STRAND / DISCIPLINE	**DC.CC.F.**	**Functions**
STANDARD / ESSENTIAL SKILL	**F-LE.**	**Linear and Exponential Models**
STUDENT EXPECTATION / ESSENTIAL SKILL		**Construct and compare linear and exponential models and solve problems.**
EXPECTATION	**F-LE.1.**	**Distinguish between situations that can be modeled with linear functions and with exponential functions.**
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CONTENT STANDARD / STRAND / DISCIPLINE	**DC.CC.G.**	**Geometry**
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Washington DC Academic Standards

Science

Grade **11** - Adopted: **2013**

CONTENT STANDARD / STRAND / DISCIPLINE	**DC.HS-PS.**	**PHYSICAL SCIENCE**
STANDARD / ESSENTIAL SKILL	**HS-PS1.**	**Matter and Its Interactions**

STUDENT EXPECTATION / ESSENTIAL SKILL		**Students who demonstrate understanding can:**
EXPECTATION	HS-PS1-4.	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
CONTENT STANDARD / STRAND / DISCIPLINE	**DC.HS-PS.**	**PHYSICAL SCIENCE**
STANDARD / ESSENTIAL SKILL	**HS-PS3.**	**Energy**
STUDENT EXPECTATION / ESSENTIAL SKILL		**Students who demonstrate understanding can:**
EXPECTATION	HS-PS3-3.	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.
CONTENT STANDARD / STRAND / DISCIPLINE	**DC.HS-PS.**	**PHYSICAL SCIENCE**
STANDARD / ESSENTIAL SKILL	**HS-PS4.**	**Waves and Their Applications in Technologies for Information Transfer**
STUDENT EXPECTATION / ESSENTIAL SKILL		**Students who demonstrate understanding can:**
EXPECTATION	HS-PS4-2.	Evaluate questions about the advantages of using a digital transmission and storage of information.
CONTENT STANDARD / STRAND / DISCIPLINE	**DC.HS-LS.**	**LIFE SCIENCE**
STANDARD / ESSENTIAL SKILL	**HS-LS2.**	**Ecosystems: Interactions, Energy, and Dynamics**
STUDENT EXPECTATION / ESSENTIAL SKILL		**Students who demonstrate understanding can:**
EXPECTATION	HS-LS2-7.	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
CONTENT STANDARD / STRAND / DISCIPLINE	**DC.HS-ESS.**	**EARTH AND SPACE SCIENCE**
STANDARD / ESSENTIAL SKILL	**HS-ESS2.**	**Earth's Systems**

STUDENT EXPECTATION / ESSENTIAL SKILL		**Students who demonstrate understanding can:**
EXPECTATION	HS-ESS2-4.	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
CONTENT STANDARD / STRAND / DISCIPLINE	**DC.HS-ESS.**	**EARTH AND SPACE SCIENCE**
STANDARD / ESSENTIAL SKILL	**HS-ESS3.**	**Earth and Human Activity**
STUDENT EXPECTATION / ESSENTIAL SKILL		**Students who demonstrate understanding can:**
EXPECTATION	HS-ESS3-1.	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
EXPECTATION	HS-ESS3-2.	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
EXPECTATION	HS-ESS3-3.	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
EXPECTATION	HS-ESS3-4.	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
EXPECTATION	HS-ESS3-6.	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
CONTENT STANDARD / STRAND / DISCIPLINE	**DC.HS-ETS.**	**ENGINEERING DESIGN**
STANDARD / ESSENTIAL SKILL	**HS-ETS1.**	**Engineering Design**
STUDENT EXPECTATION / ESSENTIAL SKILL		**Students who demonstrate understanding can:**
EXPECTATION	HS-ETS1-1.	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
EXPECTATION	HS-ETS1-2.	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
EXPECTATION	HS-ETS1-3.	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

CONTENT STANDARD / STRAND / DISCIPLINE	**DC.11-12.RST.**	**Reading Standards for Literacy in Science and Technical Subjects**
STANDARD / ESSENTIAL SKILL		**Key Ideas and Details**
STUDENT EXPECTATION / ESSENTIAL SKILL	11-12.RST.2.	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
STUDENT EXPECTATION / ESSENTIAL SKILL	11-12.RST.3.	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

CONTENT STANDARD / STRAND / DISCIPLINE	**DC.11-12.RST.**	**Reading Standards for Literacy in Science and Technical Subjects**
STANDARD / ESSENTIAL SKILL		**Craft and Structure**
STUDENT EXPECTATION / ESSENTIAL SKILL	11-12.RST.4.	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
STUDENT EXPECTATION / ESSENTIAL SKILL	11-12.RST.5.	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

CONTENT STANDARD / STRAND / DISCIPLINE	**DC.11-12.RST.**	**Reading Standards for Literacy in Science and Technical Subjects**
STANDARD / ESSENTIAL SKILL		**Integration of Knowledge and Ideas**
STUDENT EXPECTATION / ESSENTIAL SKILL	11-12.RST.9.	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

CONTENT STANDARD / STRAND / DISCIPLINE	**DC.11-12.RST.**	**Reading Standards for Literacy in Science and Technical Subjects**
STANDARD / ESSENTIAL SKILL		**Range of Reading and Level of Text Complexity**

STUDENT EXPECTATION / ESSENTIAL SKILL	11-12.RST.10.	By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.

CONTENT STANDARD / STRAND / DISCIPLINE	**DC.11-12.WHST.**	**Writing Standards for Literacy in Science and Technical Subjects**
STANDARD / ESSENTIAL SKILL		**Text Types and Purposes**
STUDENT EXPECTATION / ESSENTIAL SKILL	**11-12.WHST.2.**	**Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.**
EXPECTATION	11-12.WHST.2.d.	Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

CONTENT STANDARD / STRAND / DISCIPLINE	**DC.11-12.WHST.**	**Writing Standards for Literacy in Science and Technical Subjects**
STANDARD / ESSENTIAL SKILL		**Production and Distribution of Writing**
STUDENT EXPECTATION / ESSENTIAL SKILL	11-12.WHST.4.	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
STUDENT EXPECTATION / ESSENTIAL SKILL	11-12.WHST.6.	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Washington DC Academic Standards

Science

Grade **12** - Adopted: **2013**

CONTENT STANDARD / STRAND / DISCIPLINE	**DC.HS-PS.**	**PHYSICAL SCIENCE**
STANDARD / ESSENTIAL SKILL	**HS-PS1.**	**Matter and Its Interactions**
STUDENT EXPECTATION / ESSENTIAL SKILL		**Students who demonstrate understanding can:**
EXPECTATION	HS-PS1-4.	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

CONTENT STANDARD / STRAND / DISCIPLINE	**DC.HS-PS.**	**PHYSICAL SCIENCE**
STANDARD / ESSENTIAL SKILL	**HS-PS3.**	**Energy**
STUDENT EXPECTATION / ESSENTIAL SKILL		**Students who demonstrate understanding can:**
EXPECTATION	HS-PS3-3.	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

CONTENT STANDARD / STRAND / DISCIPLINE	**DC.HS-PS.**	**PHYSICAL SCIENCE**
STANDARD / ESSENTIAL SKILL	**HS-PS4.**	**Waves and Their Applications in Technologies for Information Transfer**
STUDENT EXPECTATION / ESSENTIAL SKILL		**Students who demonstrate understanding can:**
EXPECTATION	HS-PS4-2.	Evaluate questions about the advantages of using a digital transmission and storage of information.

CONTENT STANDARD / STRAND / DISCIPLINE	**DC.HS-LS.**	**LIFE SCIENCE**
STANDARD / ESSENTIAL SKILL	**HS-LS2.**	**Ecosystems: Interactions, Energy, and Dynamics**
STUDENT EXPECTATION / ESSENTIAL SKILL		**Students who demonstrate understanding can:**
EXPECTATION	HS-LS2-7.	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

CONTENT STANDARD / STRAND / DISCIPLINE	**DC.HS-ESS.**	**EARTH AND SPACE SCIENCE**
STANDARD / ESSENTIAL SKILL	**HS-ESS2.**	**Earth's Systems**
STUDENT EXPECTATION / ESSENTIAL SKILL		**Students who demonstrate understanding can:**
EXPECTATION	HS-ESS2-4.	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.

CONTENT STANDARD / STRAND / DISCIPLINE	**DC.HS-ESS.**	**EARTH AND SPACE SCIENCE**
STANDARD / ESSENTIAL SKILL	**HS-ESS3.**	**Earth and Human Activity**
STUDENT EXPECTATION / ESSENTIAL SKILL		**Students who demonstrate understanding can:**
EXPECTATION	HS-ESS3-1.	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
EXPECTATION	HS-ESS3-2.	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
EXPECTATION	HS-ESS3-3.	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
EXPECTATION	HS-ESS3-4.	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
EXPECTATION	HS-ESS3-6.	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
CONTENT STANDARD / STRAND / DISCIPLINE	**DC.HS-ETS.**	**ENGINEERING DESIGN**
STANDARD / ESSENTIAL SKILL	**HS-ETS1.**	**Engineering Design**
STUDENT EXPECTATION / ESSENTIAL SKILL		**Students who demonstrate understanding can:**
EXPECTATION	HS-ETS1-1.	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
EXPECTATION	HS-ETS1-2.	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
EXPECTATION	HS-ETS1-3.	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Grade **12** - Adopted: **2010**

CONTENT STANDARD / STRAND / DISCIPLINE	**DC.11-12.RST.**	**Reading Standards for Literacy in Science and Technical Subjects**
STANDARD / ESSENTIAL SKILL		**Key Ideas and Details**

STUDENT EXPECTATION / ESSENTIAL SKILL	11-12.RST.2.	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
STUDENT EXPECTATION / ESSENTIAL SKILL	11-12.RST.3.	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
CONTENT STANDARD / STRAND / DISCIPLINE	**DC.11-12.RST.**	**Reading Standards for Literacy in Science and Technical Subjects**
STANDARD / ESSENTIAL SKILL		**Craft and Structure**
STUDENT EXPECTATION / ESSENTIAL SKILL	11-12.RST.4.	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
STUDENT EXPECTATION / ESSENTIAL SKILL	11-12.RST.5.	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
CONTENT STANDARD / STRAND / DISCIPLINE	**DC.11-12.RST.**	**Reading Standards for Literacy in Science and Technical Subjects**
STANDARD / ESSENTIAL SKILL		**Integration of Knowledge and Ideas**
STUDENT EXPECTATION / ESSENTIAL SKILL	11-12.RST.9.	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
CONTENT STANDARD / STRAND / DISCIPLINE	**DC.11-12.RST.**	**Reading Standards for Literacy in Science and Technical Subjects**
STANDARD / ESSENTIAL SKILL		**Range of Reading and Level of Text Complexity**
STUDENT EXPECTATION / ESSENTIAL SKILL	11-12.RST.10.	By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.
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STUDENT EXPECTATION / ESSENTIAL SKILL	**11-12.WHST.2.**	**Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.**
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STANDARD / ESSENTIAL SKILL		**Production and Distribution of Writing**
STUDENT EXPECTATION / ESSENTIAL SKILL	11-12.WHST.4.	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
STUDENT EXPECTATION / ESSENTIAL SKILL	11-12.WHST.6.	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.